

AUTOMATIC EXCHANGE DECOMPRESSION CHANGE-OVER UNIT FOR MEDICINAL GASES LH SERIES

USE AND MAINTENANCE

CAUTIONS

Please read the following instruction carefully

- Do not lubricate or grease device: it may explode or cause burns
- The device had to be used only by trained on purpose workers
- Use only original spare parts
- Any sort of servicing had to be done by the delta P s.r.l. or by engineers of the same firm.
- Do not remove labels on the device
- Use protective glasses
- Some little leaks may happen, due to loosening of connection for the vibrations caused by long lasting transports; look for these leaks using the appropriate fluid

1. Use

Decompression of therapeutic gases which can be compressed or bottle liquified gases, directed to medicinal gases distributive system acting in conformity with European regulation EN 737-3.

Use gas: see process gas (specifications)

2. Manufacturing

delta P S.r.l.

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3. Description

Automatic exchange decompression power plant for medicinal gas composed of a metallic box of control, two high pressure valves, two reducers of high pressure, a pneumatic exchanger with a detector for the identification of the source in use.

Power plant allows to manage two feeding sources. One is the source in distribution, the second one is the reserve source. When source in distribution is exhausting, the reversing gear allows the system to capture gas from the reserve source that becomes delivering source. Every source moreover is provided with a pressure switch which point out with an alarm source in exhaustion.

The used pressure reducers (series 2232) are suitable to resist to inlet pressures of 220 bar.

4. Specifications

Table 1.

Code	Process Gas	Pin max	Pin min	High pressure connection
9258-2002M	O ₂	200 bar	20 bar	UNI 4406
9289-2002M	N ₂ O	110 bar	20 bar	UNI 9097
9313-2002M	Air	200 bar	20 bar	UNI 4410
9314-2002M	CO ₂	110 bar	20 bar	ISO 5145

Table 2. – specification for all the change-over units

Output pressure:	8-9 bar (change-over unit is provided og output preesure regulated to 8.5 bar)
Throughput:	see throughput diagram
Using temperature:	-20 ÷ +60 °C
Pressure gauge Accuracy:	1.6 % v.f.s.
Output connection:	G1/2 M
Pressure switch connection a.p.:	G1/8 F
Relief valves exhaust connection	Nose joint G 3/8 M tube Ø10
Overall dimensions (mm):	350 x 260 x 210

The change-over unit has been manufactured referring to the following regulations

- EN 738-1
- EN 738-2
- prEN13159
- EN 837-1
- EN 737-3

5. Installing the change-over unit

Cautions

- Installation has to be done only by delta P s.r.l. engineers
- Do not use grease or oil
- Use protective glasses
- Place the change-over unit safely from rain and severity of the weather, in a place suitable to storage of compressed and liquefied gas bottle for medical use.
- Do not remove protecting caps of all the pipe-fittings till the connections aren't done.
- Use high pressure winding lines provided of pipe fitting in conformity with UNI regulations as table par. 4, for the connection of bottles or inlet manifolds. Winding lines have to be manufactured in conformity with UNI EN 737-3 and EN 13221.
- Winding lines and all the elements located upstream of the change-over unit have to be clean and degreased

Installing the change-over unit

1. Take out the change-over unit of the packaging just before installation.
2. Fix the change-over unit to a solid support or at a wall.
3. Connect outlet (11) to the line and install a interception ball valve just downstream of the plant
4. Connect high pressure winding lines to the inlet pipe fittings (1s –1d), verify that winding lines threads are in conformity with reference regulation of table 1, high pressure winding lines have to be in conformity with EN13221 regulation.
5. Make the winding line-inlet connection using two spanners to avoid pipe fitting rotation.

Safety valves exhausts connection

European regulation EN 737-3, provides for safety valves exhaust to be conveyed out of the housing of the change-over units in a free place (open air).

If gases provide for these valves:

1. Unscrew pipe fittings 12s e 12d.
2. Connect a tube Ø10.
3. Screw again pipe fittings 12s e 12d.

Installation controls

1. When all the appropriate connections are done, raise steam the change-over unit SLOWLY opening high pressure valves of manifolds or bottles, keeping closed valves (4s e 4d).
2. Verify with a specific liquid substance possible gas-leak in the winding lines – inlet connection (1d, 1s). If some gas leaks are found, replace the inlet gasket and verify that the coupling is clean.
3. Open slowly valves 4d and 4s and verify that pressure gauges 7d and 7s show inlet pressure value
4. Verify that the pressure gauge 10 shows pressure value between 8 and 9 bar.
5. Verify with a specific liquid substance possible gas-leak at the inner connecting points.

Pneumatic exchanger working control

Pneumatic exchanger 9 allows to invert the distribution from the exhausted manifold to the reserve manifold.

1. The change-over unit has to deliver gas, taking it downstream of the same.
2. Verify that valves 4s and 4d are open and feeding sources are full
3. Identify the manifold without reserve, that is the one where the gauge (8s or 8d) oppose to pressure with finger and isn't free to flow inside its seat (source on the side where it doesn't happen is the delivering source)
4. Close valve 4 corresponding to delivering source (opposite to that of the secondary source).
5. After few seconds (if the plant is delivering gas) pneumatic exchanger 9 will do the change
6. Open again valve 4 which was closed, and do the exchange again as previously.

Note: It's possible to effect the exchange also manually pushing with strength the gauge which offers resistance to pressure with finger and isn't free to flow inside its seat.

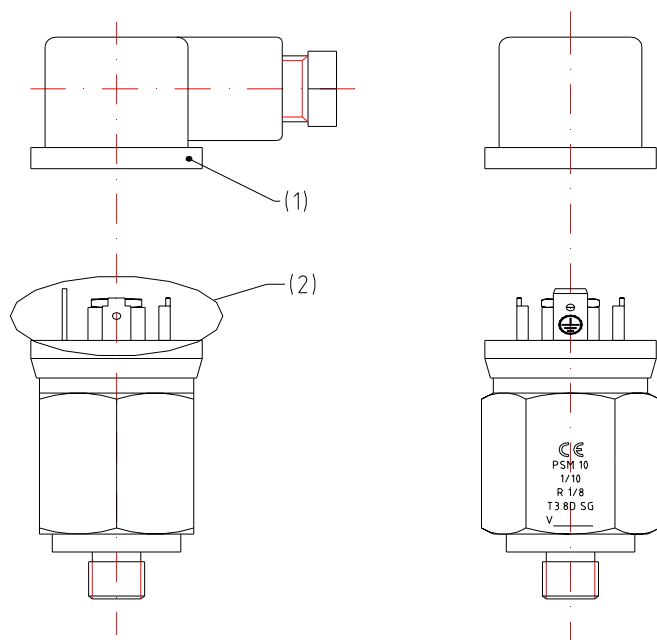
Attention: During manual exchange verify that the gauge is pushed till the end run.

Preheaters

For some process gases it is necessary to use pre-heaters with suitable dimensions, situated at the inlet of the change-over unit

Pressure switches connection

Pressure switches 5d and 5s placed inside the change-over unit, allow to control charging rate of feeding sources. They are pre-set at 20 bar and are installed downstream of the valves s and 4d, in such a way that if valves were wrongly closed, the pressure switch reports lack of gas.



1. Disconnect protecting cap by a cablepress by mean of the suitable screw situated above
2. Take out the terminal board from the cap
3. Connect the master to the terminal 3 and the second pole to the terminal 1 (alarm NC) or to the terminal 2 (alarm NA)
4. Connect the earth to the suitable terminal
5. Connect the cap again reminding the through gasket

Alarms

Delta P can provide an alarm suitable for the plant, supply alarm which controls right and left source pressure, third source manifold pressure, high and low line pressure, or a simple alarm for the right and left source control.

Alarm codes

2640-2025M	Supply alarm
8664-2025M	Supply alarm with embedded box
8665-2025M	Supply alarm with external box
2493-2025M	2 sources alarm 220 Vc.a.
8618A-2025M	2 sources alarm with external box
8618B-2025M	2 sources alarm with embedded box
2441-2025M	Line alarm
8608A-2025M	Line alarm with external box
8608B-2025M	Line alarm with embedded box

6. Using the plant

ATTENTION: before make the plant working verify that plant to feed is in conformity to regulation EN 737-3 and put under applicable tests described in cited regulation the same plant using the instruction written on this handbook to edit control lists.

When you have done the appropriate connections as described at par. 5, the change-over unit can deliver gas to the line.

Line pressurization

- Verify that valves 4s and 4d are closed.
- Open slowly interception valves of bottles and manifolds
- Open SLOWLY valves 4s e 4d.
- Verify that there is high pressure by pressure gauges 7s e 7d.
- Verify that pressure gauge 10 shows a pressure between 8 and 9 bar.
- Open SLOWLY interception valve downstream of the unit and wait that the unit is completely full.

Use

After the complete installation and line pressurization, change-over unit is ready to be used.

Replacement of an exhausted source

We can suppose that the right source is working:

1. Pressure value of the right source decreases under 20 bar.
2. Right pressure switch and supply alarm point out that the source is exhausting

Worker operates as follows:

1. Closes valve 4d verifying that valve 4s is open and the left source is full
2. Verifies that the exchange is done controlling gauges 8d e 8s.
3. Replaces exhausted source
4. Opens very slowly valve 4d.

7. Reducers setting

Cautions for modification of setting values

- We don't recommend to do this operation if you don't need it.
- Reducers have to be set at the same output pressure on the contrary pneumatic exchange device can't work correctly.
- We recommend, if possible, to do the setting of reducers at test bench using the same inlet pressure for the two reducers.
- Use only clean and degreased tools
- Setting operation must be done being sure that there aren't danger for the patients
- Reducers setting has to be done by engineers

Modification of output pressure value

Pressure value must be between 8 and 9 bar.

We can consider to set first right reducer 2d.

IMPORTANT: *The two reducers must be set at the same inline and at the same delivering value.*

1. Close inline valve 4s.
2. Verify by pressure gauge 7d or make the plant to deliver gas by the right source
3. Unscrew adjusting screw cap 3d and make the pressure adjusting reading its value on pressure gauge 10 (rotating adjusting screw clockwise pressure increases, counterclockwise decreases).
4. Screw again cap 3d.
5. Open slowly valve 4s.
6. Close valve 4d.
7. Verify by pressure gauge 7d or make the plant to deliver gas by the left source
8. Unscrew adjusting screw cap 3s and make the pressure adjusting reading its value on pressure gauge 10 (rotating adjusting screw clockwise pressure increases, counterclockwise decreases).
9. Screw again cap 3s.
10. Open slowly valve 4d.

8. Periodical servicing

Advices for the periodical servicing

- Do the periodical servicing using suitable tools and monosize spanner.
- All the tools used for periodical servicing have to be clean and degreased
- Use protective glass during periodical servicing
- Any sort of servicing had to be done by delta P s.r.l. engineers.
- Use only original spare parts and products of delta P s.r.l.
- Delta P s.r.l. declines all responsibility for periodical servicings and installations done by non authorized and qualified workers
- Delta P s.r.l. declines alla responsibility for the use of non- original spare parts

We recommend to bring up to date a periodical servicing book referring to all operations done by engineers on the device.

At par 12 there is an example of a periodical servicing book, the first part must be fill in when the device is installed, the second part can be photocopied and fill in at every periodical servicing, the book must be disposable for engineers who work with the change-over unit.

- Unscrew reducers and/or pneumatic exchanger to be replaced and ask for the new reductor delta P. Old reductor and exchanger will be sent to delta P to be reconditioned and the subsequently replacement
- Every years operate suitable controls to verify settings and looking for gas leaks
- Verify moreover that the change-over unit realizes a correct exchange

Replacement of the reducers

Reducers codes to ask to delta P s.r.l. are following:

Code	Description
4483-2232M	RID.2232M 200-10 O ₂ / A.C. / N ₂ AUT EXCH PLANT LH series
4484-2232M	RID.2232M 200-10 N ₂ O / CO ₂ AUT EXCH PLANT LH series

To replace reducers see handbook provided in the reducers package.

Quarterly checks

We recommend to do these quarterly checks :

- Check that the pressure shown by pressure gauge 10 is between 7 and 10 bar
- Look for any leaks at the connections using a suitable fluid
- Verify that valves 4d and 4s are completely open
- When the two sources are at the same charge level and the change-over unit doesn't deliver gas, verify that pressure gauges 7d e 7s show the same pressure value.

Check of the correct working of the exchange device

The test must be done when the change-over unit is delivering gas taking it downstream of the same.

If we consider that the delivering source is the right one, for example (gauge 8d doesn't make resistance to pressure with finger and is free to flow inside its seat), in case that the delivering source is the left one, must the operations be inverted on the symmetric components.

1. Close valve 4d.
2. Verify that pressure switch and alarm show that the right source is empty when the pressure switch pressure 7d decreases under 20 bar.
3. Verify that the pneumatic exchanger 9 does the exchange, gauge 8d is opposing resistance to the pressure with hand and isn't free to flow inside its seat; if the exchange doesn't occur, open immediately and very slowly valve 4d.

Troubleshooting

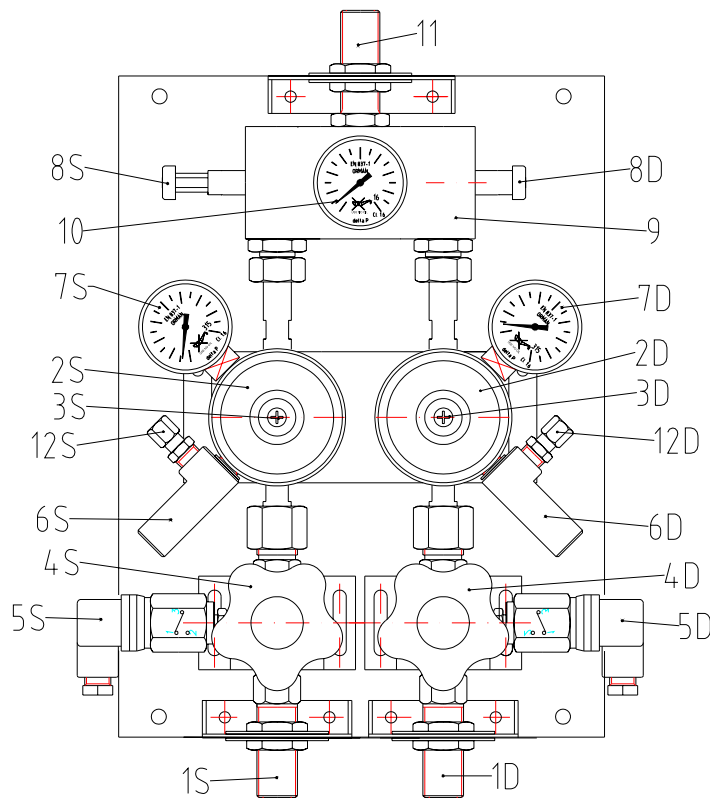
POSSIBLE ANOMALY	POSSIBLE CAUSES	POSSIBLE SOLUTION
Change-over unit doesn't do the exchange	Supply source is empty	Close interception valve (4) and replace empty bottle
	Interception valve of the supply source is closed.	Open interception valve (4) of the supply source.
	Reducers aren't set at the same pressure.	Set reducers at the same output pressure as described at par. 7.
	The exchanger is stalled.	Make manually the exchange using few times gauges (8s e 8d). If is impossible to reset the anomaly, contact delta P S.r.l.
Supply source is empty even if it wasn't used	There are leaks from connections..	Close interception valve, replace the source and verify with a suitable fluid that there aren't leaks at connections.
	The exchanger doesn't work correctly	Replace the exchanger.
Alarm doesn't signal that the source is going empty.	Pressure switch connection isn't correct	See alarm and pressure switch handbooks.
	Pressure switch isn't correctly set.	Replace pressure switch.
Alarm enter upon office also when device works coorectly	Pressure switch connecion isn't correct.	Connect pressure switch in the right way as described at par.5
After resetting alarm goes on ringing .	Alarm wasn't reset	Push alarm reset key .
<i>If any other anomaly occur, contact delta P S.r.l.</i>		

Spare parts codes

Drawing reference	Code	Description
7s - 7d	2599-1081	High pressure pressure gauge 0 ÷ 315 bar for change-over units 9258-2002M e 9313-2002M (gas O ₂ e Air)
7s - 7d	2600-1081	High pressure pressure gauge 0 ÷ 160 bar for change-over units 9289-2002M e 9314-2002M (gas N ₂ O e CO ₂)
10	2602-1085	Low pressure pressure gauge
6d - 6s	9345-2019	Relief valve
4d - 4s	8709-1073	High pressure valve
5s - 5d	8662-2015	Pressure switch
9	8520-2050	Pneumatic exchanger
	2923-1600R	Spare parts kit 2232M O ₂ , A.C., N ₂
	2924-1600R	Spare parts kit 2232M N ₂ O and CO ₂

Note: for the regulator complete see par. 8

9. Change-over unit diagram



CAPTION:

- | | |
|-----------|--|
| 1s – 1d | Inline connection suitable for every gas |
| 2s – 2d | Pressure reducer series 2232M for plant |
| 3s – 3d | Adjusting output pressure screw cap |
| 4s – 4d | Interception valve of high pressure at seat and metallic stopper which have passed adiabatic compression test as requested by EN 737-3 |
| 5s – 5d | High pressure pressure switch 20 bar preset which have passed adiabatic compression test as requested by EN 737-3 |
| 6s – 6d | Relief valve |
| 7s – 7d | Pressure gauge of high pressure in conformity to EN 837-1. |
| 8s – 8d | Gauges of delivering manifold and supply manifold |
| 9 | Pneumatic exchanger |
| 10 | Output pressure pressure gauge |
| 11 | Output connection G1/2 M |
| 12s – 12d | Connection junction relief valve exhausting |

10. Diagram pressure throughput of pressure reducer 2232M(LH) series

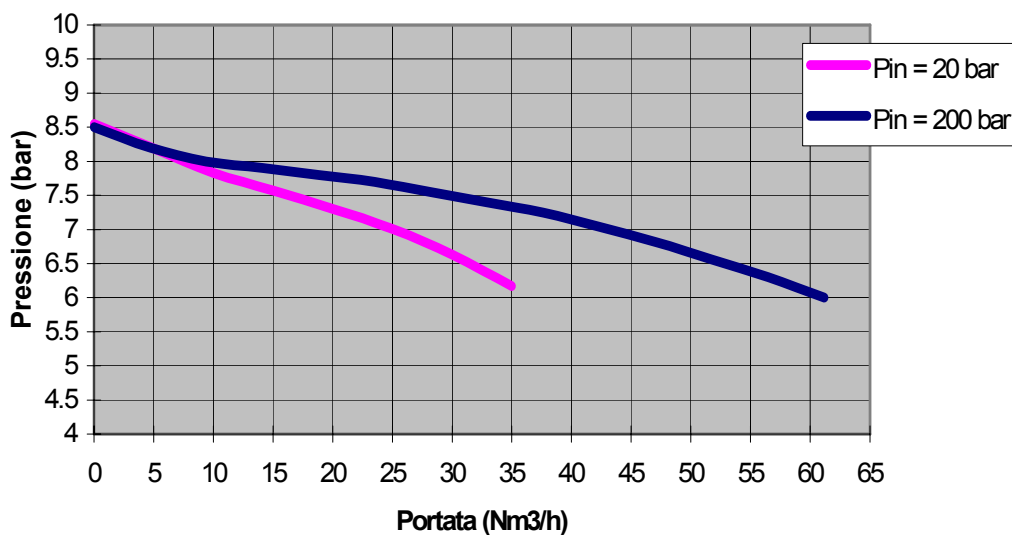
Test fluid	Nitrogen
Inline pressure	see diagram
Temperature	23°C

Conversion ratios

To know the throughput of another gas, multiply the value on the preceding diagram by the ratio given by the following table:

Air	0.941
Oxygen	0.935
Carbon dioxide	0.761
Nitrogen protoxide	0.795

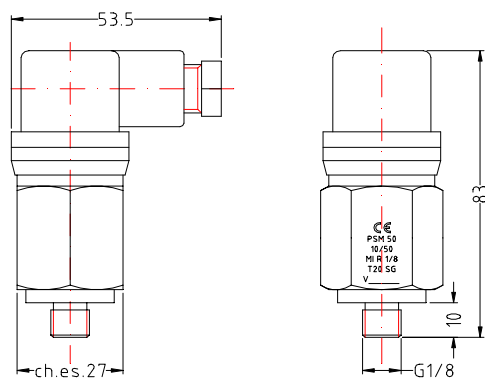
Throughput curve red.2232M for plant LH series



11 Pressure switches

The pressure switches have passed adiabatic compression test and are preset at 20 bar pressure

Pressure switch code 8662-2015



Degreased with oxygen (*)

Feeding 12-24 Volt

Pressure max 220 bar

Alarming pressure 20 bar

Protection IP65

Contacts NC-NA

Max resistive current: 6A

Max inductive current: 2A

Brass body

Glue label PT20

Type: PSM 50 MI R 18 T20D SG

Furnisher code: 30 131 711 T20D SG

(*) Pressure switch have passed adiabatic compression test as requested by EN 737-3

12. Periodical servicing book

PERIODICAL SERVICING BOOK

DECOMPRESSION CHANGE-OVER UNIT FOR MEDICINAL COMPRESSED OR LIQUIFIED GASES SERIES LH

Manufacturing : delta P s.r.l. Viale Longarone, s.n.c. Zibido San Giacomo (MI)
tel. 02.9000.5313 02-90005239

Code:	
Batch:	
Installation date:	
Working gas:	
Outline pressure:	

Periodical servicing paper

Periodical servicing date:	
Periodical servicing firm:	
Leaks search:	
Outline pressure check:	
Exchange device check:	
Alarm device check:	

Repaired or replaced parts

Notes:

Maintenance man signature

13 Handbook validità

This handbook is suitable for the following product code

Code	Description
9258-2002M	Change-over unit LH aut. Exch. O ₂
9289-2002M	Change-over unit LH aut. Exch N ₂ O
9313-2002M	Change-over unit LH aut. Exch AC
9314-2002M	Change-over unit LH aut. Exch CO ₂
9543-2002M	Change-over unit LH aut. Exch N ₂